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ABSTRACT

The purpose of the research and development described in this report is to implement and operate an on-line, computerized regional library system that makes available to faculty and students in individual colleges and universities the library resources throughout a region, while at the same time decelerating the rate of rise of per-student library costs. The major intellectual problem solved in the course of the investigation was the design of on-line computer files of bibliographic records and a technique for efficient retrieval of bibliographic data from the files employing derived, truncated search keys. The research and development culminated in the successful implementation of an on-line union catalog and shared cataloging system. A variety of libraries, large and small, had demonstrated that not only could the system slow the rate of rise of per-student costs, but also could effect net savings for libraries. The conclusions of this report are that the Ohio College Library Center (OCLC) system does make available library resources throughout a region to individuals at a participating institution, that it decelerates the rate of rise of per-student costs and can effect net savings, and is transferrable to other regions. (The appendices are LI 004 423 through LI 004 428.) (Author/SJ)

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Final Report

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THE DEVELOPMENT OF A COMPUTERIZED REGIONAL LIBRARY SYSTEM

June 1973

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ABSTRACT

The purpose of the research and development described in this report is to implement and operate an on-line, computerized regional library system that makes available to faculty and students in individual colleges and universities the library resources throughout a region, while at the same time decelerating the rate of rise of per-student library costs. The major intellectual problem solved in the course of the investigation was the design of huge, on-line computer files of bibliographic records and a swift technique for efficient retrieval of bibliographic data from the huge files employing derived, truncated search keys.

The research and development culminated in the successful implementation of an on-line union catalog and shared cataloging system in the late summer of 1971. At the end of the contractual period, this on-line catalog contained over a half million catalog records and over 800,000 location listings in the on-line union catalog. A variety of libraries, large and small, had unambiguously demonstrated that not only could the system slow the rate of rise of per-student costs, but also could effect net savings for libraries. Well before the end of the contractual period, the Ohio College Library Center had negotiated agreements with five other regions including the Cooperative College Library Center in Atlanta, Georgia, whereby the other regions were obtaining service from Columbus,

and some had the intent of replicating the computer system in their own regions. The conclusions of this report are that the OCLC system does make available library resources throughout a region to individuals at a participating institution, that it decelerates the rate of rise of per-student costs and indeed can effect net savings, and is transferrable to other regions where it is already being increasingly used.

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INTRODUCTION

This report describes research, development, and implementation of a computerized, on-line regional library system at the Ohio College Library Center (OCLC). The principal substantive objective of the OCLC system is to make available throughout a region to individual students and faculty members at a participating institution, the library resources of the region, while at the same time striving for the economic goal of decelerating the rate of rise of per-student costs in academic libraries.

This final report covers the three-year period from 1 January 1970 through 31 December 1972. The Council on Library Resources joined with the Office of Education in support of this project during the final eighteen months. The Council granted $75,000 to sustain the research and development during the last nine months of the period, while the Office of Education furnished another $75,000 expended during the first nine months. The Office of Education also made available $50,000 for the demonstration of the OCLC system operating with the Cooperative College Library Center, a centralized book processing center in Atlanta, Georgia. OCLC expended the moneys available entirely on research and development activities, but this report includes some discussions of operations that are the implementation of development.

The original research proposal for the first eighteen-month period requested $203,120 that the Office of Education reduced to $90,135 largely by eliminating funds to support a computer during the research and development period prior to on-line operation. Fortunately, the Xerox Corporation, manufacturer of the computer selected, agreed to make the computer available to OCLC on lease for eighty-two months with the payments for the eighty-two months to be made during the last seventy-two months of the lease. This happy arrangement made it possible for OCLC to have a computer during the research and development period when there was no income from operations.

The second research proposal for the second eighteen-month period requested $215,000 that the Office of Education and the Council on Library Resources reduced to $150,000 thereby making necessary elimination of work on one of the three systems proposed in the second request. A poll of the OCLC membership early in the second eighteen-month period revealed that members overwhelmingly wanted a technical processing system and serials control; the circulation system was a poor third in the poll. Therefore, the Center deferred development of the remote catalog access and circulation control system that had been included in the second research proposal.

Shortly after the inception of the project in January

1970, the Center added seven positions to the staff supported by Office of Education funds; these positions included a systems analyst, programmers, and a librarian. This group immediately began to work on the development of the on-line union catalog and shared cataloging system and to accelerate development of an off-line catalog production system on which the Center had initiated activity prior to January 1970.

The off-line catalog production system began to supply catalog cards to three member libraries in the spring of 1970 and started general operation for all members who wished to participate in July 1970. The system proved a success with the Center furnishing a total of 440,711 catalog cards at an average cost of 6.92¢ during the subsequent twelve months.

Five outstanding authorities in library automation and regional networks accepted appointment to the OCLC Advisory Committee funded by the Office of Education contract: Henriette D. Avram, MARC Development Office, Library of Congress, Washington, D. C.; Richard E. Coward, Head, Research and Development, The British National Bibliography, London, England; Richard M. Dougherty, then Acting Director of Libraries, University of Colorado, Boulder, Colorado; Peter Paulsen, Technical Processess Librarian, The New York State Library, Albany, New York; and Josephine Pulsifer, then Chief, Technical Services and Development, Washington State Library, Olympia, Washington.

The Advisory Committee first met on 30 April 1970 to review OCLC's overall plans in general and shared cataloging plans in particular. The Committee expressed no serious criticism of OCLC's planning for development of its five major projects and felt that the system design for the on-line union catalog and the shared cataloging project was adequate. Partly as the result of the Committee's concern about problems that would be generated by implementation, a considerable amount of effort was subsequently expended working toward a solution to these problems - particularly toward solving the problem of start-up financing.

In the first week of July 1971, the Center activated a prototype, on-line system for instructional purposes. During the first half of July, the Center conducted clinics on use of the system, and subsequently terminal operators used the prototype system in their own libraries for further self-instruction.

Terminals did not arrive as scheduled, so that by the end of July there were only seventeen terminals operating in member libraries. However, within the following month the terminal manufacturer was able to install at least one terminal in each participating member library.

There was a similar delay in the activation of the telephone network, although the order for the network had been placed with AT&T in November 1970 with the target date for

full operation of the telephone net on 1 July 1971. However, OCLC was unable to use the telephone network until mid-August 1972, and even at that time not all libraries had an operational telephone connection.

The Center activated the on-line union catalog and shared cataloging system at Ohio University on 26 August 1971, and added the remaining forty-eight members plus the Pittsburgh Regional Library Center in the following month-and-a-half. Subsequently, OCLC added a terminal in Atlanta, Georgia for the Cooperative College Library Center (CCLC) in accordance with the contract with the Office of Education, with the New England Library Information Network (NELINET) at Dartmouth College in Hanover, New Hampshire for a test of the OCLC system supported by a Council on Library Resources grant to NELINET. Later in the period, the Center also added three terminals at Drexel University, Temple University, and the University of Pennsylvania under an agreement with the Union Catalog of Pennsylvania (ULC).

When the on-line system began operation in late August, its principal capabilities were display of union catalog location listings and on-line cataloging employing Library of Congress MARC II records; it was not possible at that time for libraries to input new records into the system, but the Center added the capability of doing input cataloging in mid-October. However, when input cataloging began operation,

it was necessary for the Center to discontinue addition of MARC II records to the data base until a complex program was available that could detect whether or not there was already in the data base a cataloging record that was a duplicate of a new MARC II record. The Center chose to implement input cataloging before it had the ability to add MARC II records to the data base containing catalog records input by participating libraries because with input cataloging activated a library could catalog any title, whereas previously a library could only catalog books in the MARC II data base. The Center began to add MARC II records again in mid-January 1972, and after that time the major capabilities of the system were available.

The OCLC comprehensive on-line library system is an integrated system wherein there will be only one file of bibliographic records that will participate in cataloging, serials control, acquisitions, circulation, and information retrieval subsystems. Similarly, the various subsystems will use common access indexes and date and name and address files. Hence, the elaboration of the on-line union catalog and shared cataloging subsystem during the period has enhanced the activation of serials control and the technical processing system.

At the end of the period under review, the membership of the Ohio College Library Center effected an important

organizational change in the Center by amending the Articles of Incorporation so that non-academic libraries of Ohio may join the Center as full members. The Amendment states, "The term libraries of Ohio (both state and private) shall be and hereby is defined as those libraries within the State of Ohio operated exclusively for educational and scientific purposes as shall at all times hereafter qualify as an exempt organization or organizations under Section 501 (c) (3) of the Internal Revenue Code of 1954 (or the corresponding provision of any future United States Internal Revenue Law)".

Table 1 records the number of titles that OCLC members and other regional centers cataloged on the system from 26 August 1971 through 31 December 1972. Clearly, an on-line, computerized regional library system containing over four thousand miles of telephone circuitry and on which participating libraries cataloged 583,150 titles during the first sixteen months of operation is a system that not only works but also holds the potential of being the prototype for a national and international system.

Center	Total Titles Cataloged	Titles Cataloged Using Existing Records	Input Cataloging
Ohio College Library Center	495,208	342,334	152,874
Cooperative College Library Center	32,357	29,782	2,575
Pittsburgh Regional Library Center	14,703	14,642	61
New England Library Information Network	18,805	14,727	4,078
Union Library Catalog of Pennsylvania	22,077	19,015	3,062
Total	583,150	420,500	182,650

Table 1: Titles cataloged from 26 August 1971 through 31 December 1972

RESEARCH

In the summer of 1969, the Center had carried out a simulation study of the OCLC system that made it abundantly clear that an efficient file organization would be an absolutely imperitive requirement for operation of the OCLC network. The Center staff undertook research on truncated derived search keys, the findings from which were most encouraging. The principal objective of the first investigation was to determine efficiency of truncated search keys in retrieving bibliographic descriptions of known documents employing name-and-title information. It was found that a search key consisting of the first three letters of the first word of the main entry and the first three letters of the first non-article word of the title would produce five or fewer entries on a cathode ray tube terminal 99.08% of the time if requests were made to a file of 132,808 name-and-title entries, providing it was assumed that each search key had the same probability for employment in requests (this assumption later proved to be inaccurate so that the percentages reported in the first studies were high). The Center employed, and still employs, the 3,3 search key when it implemented the on-line system, and the key has proved to be highly efficient for retrieval.

Various members of the Center's staff carried out subsequent investigations on derived truncated search keys for

title-only entries, title entries, and the construction of a call number index using a truncated call number. Results of the research make it clear that such an index will make possible swift and efficient retrieval of records employing truncated call numbers. However, the Center will not prepare a paper for publication until such a call number index has been implemented and tested.

Staff members carried out research on author indexes for personal and corporate authors. These investigations revealed that it will be possible to construct such indexes that will enable the user to find all items by a given individual or corporate author in the system. A paper on the author index (Alan L. Landgraf and Frederick G. Kilgour, "Catalog Records Retrieved by Personal Author Using Derived Search Keys") has been submitted for publication. Another paper (Alan L. Landgraf, Kunj B. Rastogi, and Philip L. Long, "Corporate Author Entry Records Retrieved by Use of Derived Truncated Search Keys") has also been submitted for publication.

John A. Wyckoff conducted research into the formulation of a technique for retrieving an entry in an on-line reply containing too many entries to be displayed on a cathode ray tube terminal. The following section of this report contains a description of this extended search technique.

Philip L. Long headed a research team that investigated problems related to the design of a hugh file of bibliographic

entries from which a single entry could be quickly retrieved. The group reported their findings in August 1971 at a meeting of the International Federation for Information Processing Societies in Ljubljana, Yugoslovia; the title of the paper is "Large On-Line Files of Bibliographic Data: An Efficient Design and a Mathematical Prediction of Retrieval Behavior". The findings of this paper have been the basis for the organization of the OCLC on-line files and actual operation has demonstrated the efficiency of the design.

DEVELOPMENT

Throughout the period under review, the Center and its Advisory Committees designed the off-line catalog production system, the on-line union catalog and shared cataloging system, the serials control system, and the technical processing system. Most of the work done on the cataloging system will facilitate implementation of the serials and technical processing systems. Furthermore, during the second eighteen-month period the programming staff spent considerable time re-designing, coding, and implementing the on-line programs so that they would be hospitable to the introduction of major new subsystems such as serials and technical processing.

CATALOGING

The Advisory Committee on Cataloging came into being in June 1970 and convened its first meeting on June 17th. Committee members were from nine member colleges and universities. The Committee proved to be an outstanding success so that meetings were soon held monthly with attendance being thirty to forty members from nearly half of the OCLC institutions, as well as representatives from NELINET. The initial purpose was to aid in completing design of the off-line catalog production system, and to design the on-line cataloging system. A major goal was system design that would interface readily with member libraries. With the assistance of Mr. John Rather of the Library of Congress, the Committee designed a record for authority files although the final design was not achieved until early 1973.

Toward the end of 1972, the Committee also began to explore the impact of the International Standard for Bibliographic Description (ISBD) upon input cataloging if the American Library Association were to adopt ISBD as a cataloging standard.

The Committee's major achievement came out of an investigation into methods for improving quality of input cataloging while maintaining input costs at the lowest possible level. The Committee produced a detailed document entitled Standards for Input Cataloging that the membership reviewed and

approved in a meeting on 17 May 1972. It is now necessary for new members joining OCLC or a new affiliate to agree to abide by the Standards for Input Cataloging (June 1972) (Appendix XII).

At the membership meeting on May 17th, members established a committee to work out procedures for implementing the Standards for Input Cataloging. This Implementation Committee has worked assiduously to devise such procedures. The Committee's approach has been technological in nature, as well as bibliographical. At the end of the review period, the Committee was working on the design and definition of three levels of bibliographic records. The first level is the Library of Congress MARC II type of record; the second level, OCLC MARC records as defined in the Standards for Input Cataloging; and the third level, a record adequate for an on-line union catalog and for circulation control, but not sufficiently complete for catalog production.

The Center anticipates that the technical processing record to be used for ordering and for control up to the time of cataloging will be too incomplete for catalog production. These records will be in the level-3 catagory, and the system will so flag them. However, an incomplete record could be the basis for porduction of a level-2 catalog record and, therefore, should be updatable.

Incomplete, or level-3, serials records, from which it will be impossible to produce catalog cards, will be analogous to entries in manual serials check-in records. It will be possible to update the bibilographic contents of incomplete serials records so that the check-in entry that a library requires will, indeed, exist. For example, if a library checks in a periodical using the title as it appears on the piece rather than the main entry and cataloger's title, the library will update the record by adding a 240 field. The system will immediately add the new title to the index so that the library will have the access it requires.

The institution of incomplete records for technical processing and serials check-in appears to be the only solution to a variety of problems. Particularly, employment of such records will reduce costs of use of the OCLC system. It would be unrealistic to expect libraries to do full cataloging to order a book, or to require libraries that do not catalog serials, and many libraries do not, to undertake full serial cataloging. Fortunately, the flexibility of the OCLC system design makes possible the incorporation of incomplete bibliographic records in the existing file structure.

The off-line catalog system produced the first cards that went into a member library's catalog (Wittenburgh University) in late February 1970. In April 1970, the system

was producing cards for catalogs of three members; Oberlin College, Ohio University, and Wittenburg University participated in the early trials of card production. At the end of June 1970, the system had produced some 5,400 cards for catalogs. In July, the off-line card production system became available to those members who wished to utilize it, and by the end of that month card production had exceeded 8,000 cards a week.

As already reported, the off-line catalog production system put out 440,711 catalog cards at an average cost of 6.92¢ per card by the end of June 1971. The cards were in finished form, alphabetized in packs for filing in specific catalogs. The cost of the off-line catalog production system was less than half the cost of manual procedures. However, off-line production depended entirely on the file of MARC II records made available by the Library of Congress. By the end of June, it appeared that some libraries were obtaining more than half of their cataloging from the off-line system.

The cost of 6.92¢ per card includes over twenty separate cost elements, plus a 3/4¢ charge for overhead. Through April 1971 the actual amount charged for overhead was 1/2¢. However, it came to the addition of the Center that suggestions had been made outside of Ohio that the Center could not produce catalog cards so cheaply without subsidization.

Because these suggestions were brought to the Center's attention by granting agencies, the obvious but unspoken implication of the suggestions was that grant funds were being used to subsidize catalog production. No grant funds subsidized catalog production costs. Because it is necessary for the Center to retrieve all funds expended on catalog production, The Center called in Haskins & Sells, Certified Public Accountants, to review the Center's costing procedures. Haskins & Sells found that all direct costs were included in the card costing, but recommended that overhead charge be increased 1/4¢.

Activation of the off-line catalog production system a year before the on-line system was to be implemented proved to be an incalculable asset. The options required by members were many more in number than originally estimated. Routinizing the complexities of the manual procedures associated with catalog production required several months to achieve smooth operation. In general, it would have been disasterous to attempt to have brought up the on-line system and catalog production at the same time; the cumulative complexities of the two tasks would have been overwhelming.

The on-line system began operation with a single library on 26 August 1971, and subsequently the Center added over a dozen new functions. Many of these functions will be required by the serials control system and technical processing.

The most major new addition to the system was the initiation of input cataloging on 18 October 1971. This function enables participating libraries to add a new cataloging record to the on-line bibliographic data base. The addition occurs within a fraction of a second after the cataloger has depressed the PRODUCE and SEND keys to activate catalog card production. The record is immediately available for use by any other participating library. A program places the record in the catalog record file, identifies its truncated entry, and indexes the record for access by LC card number, name-title, title, and OCLC-number search keys.

An important adjunct to input cataloging is the capability of the system to identify when an existing record has been edited to the extent that the edited record represents a title new to the system. A computer program subjects each edited record to a series of checks to determine whether or not a new record has been constructed. The cataloging source for such edited records is the library having done the editing, not the original cataloging library.

Another new function associated with inputting new information is the update function. When a library employs the updating function, the system does not produce catalog cards. The update function has been used primarily for conversion of member catalogs to machine readable form and for the deletion of a record or a holding statement whenever a book

has been lost or destroyed. When update is used in conversion with an existing bibliographic record, the holding institution is added to that record. When a record does not already exist in the central file, the operator keys in the new record at the terminal and adds it to the data base employing the update function. The system does not produce cards in either case.

When a library wishes to delete its holding symbol from a record, the operator calls up the record and keys in the letters "CA" and depresses the UPDATE and SEND keys. This action deletes the institution's symbol from the record.

The reformat function enables a terminal operator to review the exact data from which catalog cards will be produced subsequent to editing a record. After an operator has added, changed, or deleted a field or fields on the CRT screen, he may observe the effect of the alteration by requesting the computer to reformat the data and display the revised record on the screen before requesting catalog card production.

On 7 December 1971, the Center implemented a new module in the on-line cataloging program that enables the display of the OCLC catalog record control number, known in brief as the "OCLC number", in the fixed field area of the catalog record image displayed on the screen. The system automatically assigns an OCLC number to each record entering the catalog record file.

In January 1972, the Center activated an index to the catalog record file employing the OCLC number. The system makes extensive use of the index and operators may also use the index. Monitoring of the system usage has revealed that operators do indeed use this index.

With the activation of the OCLC number index, there are four on-line indexes to the files. Three of the indexes are complete in the sense that each record appears in each index; these three indexes are the name-title, title, and OCLC number index. The fourth index, the LC card number index, is logically a supplementary index only for those records that contain LC card numbers.

In March 1972, the Center staff implemented an added-copy function and an extra-card function. The added-copy function makes it possible for an institution to catalog two copies of a book at the same time when the two copies are in two different libraries within the institution, or to catalog an added copy at some time after the cataloging of the first copy. The added-copy function causes the system to produce cards only for the new holding library and not for the main library.

The extra-card function enables a library to obtain additional main entry cards. The system can produce as many extra cards as are desired, and they go to the library in a special extra-card pack.

When the extra-card function was introduced in March, a library could obtain extra cards only at the time of cataloging. However, in June 1972 the Center enhanced this system so that libraries can now obtain one or more extra cards at any time subsequent to the cataloging of the title.

In November 1972, the Center introduced two important new functions related to call numbers. The first was a generalized procedure for handling "K" Library of Congress call numbers, and the second a technique for using free-text call numbers. Until recently, class numbers in the Library of Congress "K" classification were incomplete, except for "KF", in that the Library of Congress had not developed the numeric portion of the class number. Because several participating libraries wished to be able to assign "K" call numbers to books being cataloged, the Center worked out a technique whereby members could provide pseudo-numerics as part of the class number subfield. The programs formated these pseudo-numerics, but the print programs suppress them on printing. An operator could employ any numeric as a pseudo-numeric. In July 1972, the Library of Congress announced a draft classification schedule for "KD", and in anticipation of further draft classification schedules, the Center developed a generalized technique in the suppression program permitting libraries to receive full call numbers on catalog cards as the Library of Congress introduces

additional "K" classes.

The implementation of a free-text call number field makes it possible for libraries to input call numbers that fit into neither LC-type nor Dewey-type call number formats. Most libraries possess special groups of materials to which they assign call numbers such as "Thesis" or "Periodical stacks". With the implementation of the free-text call number field, the OCLC system can now handle all types of call numbers employed in a library.

In June 1972, the Center activated a continuing procedure for the correction of errors in on-line catalog records. The Center distributed to participating libraries error reporting sheets on which errors are communicated to the Center. The Center corrects error only and does not change, add, or delete data to reflect the policy of any particular library.

A study done subsequent to the review period, revealed that 88% of the error correction sheets sent to the Center come from the library that did the original input cataloging. In other words, only 12% of the error reports come from libraries employing cataloging done by another library. At the time of the study, the percentage of records containing errors detected by a library other than the inputting library was .6%. Undoubtedly, this percentage will go up somewhat with further usage of input records.

In May 1972, the Center implemented an automatic procedure for checking illegal field tags. Subsequent to the activation of this procedure, the system would refuse to produce catalog cards for records containing illegal tags. In October 1972, the Center expanded automatic error checking to include checks for illegal indicators, illegal subfield codes, and illegal text characters. These automatic error checks increase the accuracy of catalog records in the on-line file.

When the on-line system was first introduced, the number of entries in a reply to a search key request was limited to those entries that would occupy two screens at the request of the Advisory Committee on Cataloging. In the latter half of 1972, work was undertaken to provide an "extended search" technique wherein there would be no limitation to the number of entries that could be processed for each reply. In November 1972, before complete extended search became operational, the Center expanded the number of screens of entries from two to nine. The full extended search procedure was not implemented until early 1973, but most of the work on it was done during the period under review. At the time the Center activated the extended search function, it was possible to retrieve entries for all but eleven of over a million search keys. When first implemented, extended search handled up to 256 entries per key; when the Center increases the number of entries per reply to 1024, it will be possible to retrieve all

entries for all keys. The implementation of the extended search function completes the development of retrieval by derived truncated search keys. Extended search makes it possible to predict that search key retrieval will be efficient even with the largest collections.

The Center documented the catalog card production programs during the period of the grant; the five volumes of documentation constitute Appendices XXIV through XXVIII.

Serials Control

The Advisory Committee on Serials had its first meeting on 1 October 1971 when it convened to discuss the draft of a document prepared by the Center staff entitled, A Brief Description of the Serials Control System: A Preliminary Report, (September 1971) (Appendix V). Some thirty-odd individuals from OCLC member libraries and from other regions participating with OCLC constituted the Committee. Its first task was to determine that the system design included all products that participating libraries will require. One Committee member and two OCLC staff members visited the on-line serials control system at the Bio-Medical Library at the University of California at Los Angeles.

The Committee met monthly, and by December, had completed a Manual for Checking-in, Binding, and Claiming of Serials on a CRT Terminal - Draft of Preliminary Procedures (December 1971)

(Appendix VII). The Committee continued to meet on a monthly basis throughout most of 1972 and further refined the December version of the Manual.

The Committee also worked on standards for cataloging of serials, and in May produced Recommended Standards for the Cataloging of Serials (May 1972) (Appendix XIX).

The Committee, together with the Center staff explored several possibilities for using machine readable serials data bases constructed elsewhere as the original data base for the OCLC system. By December 1972, it appeared that the only data base that was sufficiently compatable with the MARC serials format was that at the University of Minnesota.

By December 1972, design of an on-line serials control system was complete for on-line check in, on-line union catalog, input serials cataloging, production of catalog cards, automatic claiming, and binding reports.

Technical Processing

The Advisory Committee on Technical Processing first convened on 23 February 1972. At that meeting there were twenty-five representatives from seventeen institutions. As was the case with the Advisory Committees on Cataloging and Serials, representatives from regions participating with OCLC also attended subsequent meeting.

The Committee began its deliberations by reviewing a

paper prepared by the OCLC staff entitled OCLC Technical Processing System - A Preliminary Outline (February 1972) (Appendix IX). The first task of the Committee was to design the technical processing system so that it would include all products required by participating libraries. In general the system was to issue purchase orders, maintain an outstanding order file, maintain a commitment register, to issue claims automatically for materials not received, and to clear invoices for payment. Perhaps the most difficult area in system design was that of the financial records required by the various participating libraries. In May, the Committee issued The Technical Processing System - The Ohio College Library Center (May 1972) (Appendix X). The Committee continued to work on system design with this document as a basis, and throughout the second half of the year, the Committee continued to design, redesign and redefine the document so that by the end of the year the system was sufficiently well designed so that a programming staff could undertake on-line development.

Equipment Development

After reviewing the findings of a computer simulation study of computer systems proposed to OCLC by nine computer manufacturers and a subsequent trade-off study among three computers that performed well in the simulation, the Board

of Trustees decided on 12 February 1970 to select a Xerox Sigma 5 computer. The Sigma 5 arrived at the end of August 1970 and the Center accepted the computer in mid-September. The Center staff had already begun on redesign of the computer's operating system, the monitor program that supervises execution of programs in the computer, as the result of findings in the simulation studies. One of the two principal changes in the operating system was to build into it capability to run two programs at the same time. It is now possible for the computer to run batch jobs while it is operating the on-line system without degrading on-line performance. This improvement in the operating system makes possible greater utilization of the equipment.

The other major alteration in the operating system was to make the work area of the operating system identical with that of applications programs. The simulation study had shown that this change would lower computer utilization by two-thirds and it was only with this change having been effected that the Sigma 5 and two other computers were able to process the burden of traffic at peak loads.

These two changes, and the second one in particular, have converted the general purpose computer to the specific OCLC on-line application and thereby have increased its efficiency. The operating systems in third generation computers are designed to supervise every conceivable type of program and

to do so the operating program must go through an elaborate protocol that lengthens the running time for execution of any single program. In other words, the adaptability of third generation computers is purchased at a considerable loss in efficiency. OCLC has greatly increased efficiency by changing the Sigma 5 operating system to work specifically with OCLC on-line application.

In 1972 the Center staff interfaced an IBM 1403 N1 Printer with the Xerox Sigma 5 computer for the production of catalog cards. With this equipment development the OCLC system became complete as an independent system for replication elsewhere.

Subsequent to the selection of the Sigma 5 Computer the Center staff undertook a trade-off study of cathode ray tube terminals. The staff investigated over a dozen terminals and in the final stage of the investigation the Center carried out a detailed trade-off study of three possible terminals that led to the recommendation for the selection of the Irascope LTE terminal. In the course of the study, thirty-three characteristics were used, but one of the thirty-three (reliability) could not be judged for any of the three terminals because none had reached the market, and one characteristic did not apply to selection for OCLC. Of the thirty-one remaining characteristics evaluated in the trade-off study, the Irascope excelled or was equal to the other two

terminals in twenty-eight including all nineteen characteristics of importance to the user. Spiras Systems, Inc., manufacturers of Irascope terminals, presented the Center an opportunity to advise in redesigning their terminals for bibliographic processing. The Center's staff took full advantage of this opportunity and members of OCLC's Advisory Committee also participated in the review and revision of specifications for the Irascope. The outcome was a terminal superior to any other available at that time for manipulation of bibliographic data.

Design of the telephone network began in the summer of 1970 and as noted elsewhere, the Center placed the order for the network with AT&T in November 1970. Although the Telephone Company had over seven months of lead time to bring up the network on July 1971, it was not operational until mid-August. The OCLC network is a multiple-party, multiple-line, synchronous transmission net, and although this method of operation is highly efficient and economical, it is not widely used. Hence, AT&T lacks experience with such a network. Moreover, the network invades the territories of several non-Bell system independent telephone companies, and most of these companies have been entirely lacking in computer data network experience. Nevertheless, the multitude of exasperating communications problems that arose proved to be solvable.

Toward the end of 1972, six Telefile disk drives were also interfaced with the Xerox Sigma 5. It had become clear in mid-summer that the Xerox company would be unable to supply new disk drives in sufficient time to take care of the growing on-line files. Hence, the decision to interface the Telefile drives that had a high reputation for reliability. This interface with IBM compatable drives further enhanced the independence of the OCLC system.

The staff with some participation of representatives of participating libraries also worked with Beehive Medical Electronics, Inc. of Salt Lake City, Utah in the design of a terminal to be known as the "OCLC 100 Display". This terminal contains improved design characteristics for bibliographic processing, and it is expected that it will be widely used in library automation. The OCLC 100 Display will become available in the summer of 1973.

INSTRUCTION

In May and June 1971, the Center put out two Manuals entitled Creation of Machine Readable Catalog Entries: An Adaptation of "Data Preparation Manual: MARC Editors", (Appendix III), and Cataloging on a Cathode Ray Tube Terminal (Appendix IV). In July 1971, the Center instituted formal instruction in on-line cataloging. On five days during the first half of July, the Center held day-long clinics in

Columbus at which attendance was limited to a maximum of ten participants. One staff member from each OCLC institution attended these clinics during which participants actually operated the terminal. It was expected that each attendee would in turn instruct his colleagues in his library. The procedure worked well.

To supplement the Columbus clinics, the Center staff held regional clinics in a half dozen locations in Ohio during August and September. The host library for a regional clinic invited the entire cataloging staff of neighboring libraries to attend. Staff members of all but one institution attended these regional clinics, and subsequently two OCLC staff members visited the one library that had not attended to instruct its cataloging staff.

The Manual and the two clinics enabled library staff members to become skillful users of the on-line system. It would appear that at most, two days of formal instruction is required for learning on-line cataloging, plus several days of using a terminal in training mode.

In January 1972, the Center initiated a series of bi-monthly tutorials on the use of CRT terminals for the benefit of staff members of OCLC libraries who had begun to work in the libraries subsequent to the regional clinics. These bi-monthly tutorials were reasonably well attended during the first six months after which attendance fell off markedly.

The Center now holds tutorial meetings occasionally.

Subsequent to the implementation of input cataloging the Center convened a day-long meeting in Columbus at which four speakers described procedural changes in their libraries that had come about as a result of on-line cataloing. The speakers represented a large and small library employing the Dewey decimal classification scheme, and a large and small library using the Library of Congress classification. More than one hundred and sixty staff members of OCLC libraries attended this meeting and participated in reporting changes in their libraries. The meeting was most fruitful, for it enabled participating libraries to learn of effective procedures that other institutions had developed.

The OCLC NEWSLETTER has been an important vehicle for communicating instruction on the use of new functions as they have been implemented and to correct misunderstandings concerning the use of the system.

Perhaps the most important instructional activity is the continuing personal telephonic support that the Center makes available to staff members in participating libraries. The Center encourages staff members to call a specified individual at OCLC on a WATS line whenever some untoward or inexplicable event occurs. This personalized support is of high value and has undoubtedly contributed much to the acceptance and efficient use of the on-line system.

EXTENSION TO OTHER REGIONS

As already reported, the Center extended its services to five other regions on an experimental or operation basis. Not all of the demonstrations worked well, for to do so an institution must make a complete commitment to the OCLC system; "trying it out" without making changes in institutional procedures does not necessarily reveal the benefits of the system. Trying the system for six months is analogous to trying the Library of Congress classification scheme for six months. Nevertheless, four regions in which terminals were installed have all decided to use the system either on the basis of replication of the computer system or by receiving services from Columbus. Robert C. Stewart reported on use of the OCLC system at the University of Pennsylvania in a paper entitled "Cataloging with a Computer - OCLC comes to Pennsylvania" (Appendix XXIII). In addition, perhaps a dozen other regions have discussed with OCLC the possibility of replication or extension of service from Columbus. In other words, the system has not only proved beneficial in Ohio but is beginning to be used in other regions.

The most extensive examination of the system was a test of its transferability that the New England Library Information Network (NELINET) conducted between January and June 1972 on a grant to NELINET from the Council on Library Resources. Phase I of the NELINET test was a computerized

simulation of the OCLC system and Phase II, an evaluation and demonstration of the system at the Baker Library at Dartmouth College.

COMRESS, Inc., the firm that carried out a simulation for OCLC in 1969 designed to produce information to be used in the selection of a computer, performed the simulation for NELINET. Because the shared cataloging system was in operation, COMRESS was able to validate the model of the system by comparing computed results with observed results. COMRESS performed this simulation for 35, 75, and 249 libraries employing three sets of systems: 1) shared cataloging only; 2) shared cataloging, serials control, and technical processing; and 3) shared cataloging, serials control, technical processing, remote catalog access and circulation control, and retrieval by subject. COMRESS summarized its report stating, "The OCLC system appears to be capable of performing the functions required by the NELINET consortium, be it 35, 75, or 249 libraries." Of course, the simulated "OCLC System" included additional units of equipment; the present configuration could not possibly handle all five subsystems for 249 libraries. However, The COMRESS report warned that "simulations for NELINET were configured to represent an equal distribution of messages on each route on the network. When faced with the environment of the real world, of determining which libraries will share a common

route, this will be the most significant factor in the performance of the system, as currently conceived."

Phase II of the NELINET test was a demonstration of the use of a terminal at Dartmouth College where records were kept of costs before and after on-line cataloging began. Dartmouth found full cataloging including card production costs to be 37¢ per title if cataloging information was in the OCLC data base; this cost excludes the cost of the OCLC system and includes only costs incurred at the Baker Library. Cataloging costs for titles not in the OCLC data base was $3.02. Dartmouth was able to reduce its cataloging staff through attrition subsequent to implementation of the OCLC system by seven full-time positions and three full-time equivalent part-time positions. Dartmouth concluded that if it were to pay full OCLC fees, "with a savings of over $16,000 in rental charges for MT/ST and MCRS, with little loss in efficiency, plus the tremendous staff savings we can readily meet the projected costs and still show a budgetary decrease."

OPERATIONS AND PRODUCTION

The on-line union catalog became available on 13 October 1971, and on 22 October 1971 there were approximately 113,000 institutional holdings recorded in the union catalog. These holdings included titles that libraries had processed using the off-line card production system that had been operational

from July 1970 to the inception of the on-line system. By the end of December 1972, there were over 800,000 location listings in the on-line union catalog.

On 2 December 1972, the on-line file contained 505,326 catalog records, of which 217,079 (42.9%) were OCLC MARC records, and 288,248 (57.1%) were LC MARC II records. Since there are more OCLC MARC records than MARC II records added to the file in any given period of time, the percentage of OCLC MARC records is slowly rising. The two groups of records complement each other with a surprisingly small area of overlap. When the weekly groups of MARC II records enter the file, only 5% of them replace OCLC records already in the file.

Figure 1 on page 8 shows the total number of titles cataloged on the system from 26 August 1971 through 31 December 1972 as being 583,150, of which 420,500 were cataloged using records already in the system. In other words, 72% of the cataloging done on the system employed records already in the catalog record file. This percentage, however, has a somewhat high bias due to the fact that some terminals placed outside of Ohio are little used for input cataloging when there is one terminal in a large library. The entire terminal time is employed for cataloging using records in the system.

By December 1972, the daily average of titles cataloged on the system was over two thousand, and each day, the Center

printed between sixteen and eighteen thousand catalog cards.

The system has proved to be exceptionally stable and there have been entire weeks of operation from 7:00 a.m. to 7:00 p.m. when the system had not experienced a single unscheduled ceasation of operation known as a "crash". The telephone lines have also proved to be reasonably reliable once they were operating at an acceptable level of freedom from noise. The Irascope terminals have been the least reliable components of the hardware configuration. Operation of the terminals revealed weeknesses in two modules and the manufacturer instituted a project to replace these modules with new circuits that have given improved performance. During a three-month period in early 1972, the terminals operated at 92% up-time; it is generally considered that 95% up-time is the most to be hoped for from computer equipment. The Sigma 5 far exceeds 95% up-time.

The family of programs that constitute the software components of the system have been gratifyingly free of failure, but of course have not been entirely free. Whenever the staff inserts a modification to the programs to activate a new function, there immediately follows a predictable sharp rise in "crash" rate. Extermination of the bugs that the new modification generated depresses rate of failure, but not always to the original rate. This phenomenon required partial redesign and redevelopment of the programs that the

staff carried out in the latter part of the period under review.

COSTS

Discussions and investigations during 1969 and 1970 had made it clear that it would be difficult for participating institutions to finance a 700% increase in membership fees that would occur upon implementation of the on-line system. The difficulties arose from the fact that on day one of implementation the data base would not be sufficiently large to effect eventual projected savings, and at the same time the libraries would not have been able to reduce their staffs as of day one to be able to transfer salary funds to the payment of increased membership fees. Therefore, in November 1970, the Center presented the Board of Regents of the State of Ohio with a development proposal requesting $581,587, the then projected equivalent of membership fees for one year of operation. Two-thirds of the amount was to be expended in the first year of operation and one-third in the second; members would pay one-third in the first year, and two-thirds in the second. The membership will assume payment of the full cost in the third year. This arrangement provides two years for the Center to reach a level of operation that will enable the membership to make net savings and at the same time give the member libraries two years to take advantage of normal attrition to reduce salary expenditures.

The Board of Regents approved the request as did the Ohio Department of Finance. Subsequently, the House of Representatives and the Senate passed different appropriation acts that contained the request, but they did not take final action until December 1971. Nevertheless, Ohio State funds have enabled the Center to surmount the financial obstacles presented by an inadequate data base and therefore a requirement for more staff during early years of implementation. Because the data base has now grown to over a half million catalog records, replication and implementation of the system in other regions can be achieved with more rapid realization of cost reductions.

COSTS

It has not yet been possible to do a cost study for all OCLC participating libraries to determine whether the OCLC system enables them to make a net savings, or if it does not make possible a net saving, whether or not it has lowered the rate of rise of per-student costs. However, as related above Dartmouth College demonstrated that it could make a net saving using the OCLC system, and there are other examples of specific institutions that have effected savings.

Western College in Oxford, Ohio catalogs approximately 1600 titles a year for a thousand of which it finds records in the OCLC system. It is projected that beginning in July

1973 when there will no longer be a State subsidy available for the operation of the OCLC system, the cost per record used for cataloging will be $2.00 (it should be remembered that except for the charge for catalog cards, this $2.00 charge pays for all uses made of the system). Hence, in 1973/74 Western College will be paying $2,000 for the OCLC system. Use of the system has enabled Western to reduce its full-time professional cataloger to half-time, thereby effecting a gross saving of $4,250 or a net saving of $2,250.

Ohio University in Athens, Ohio had dropped ten positions from its cataloging staff and has increased its rate of cataloging from 25,000 titles a year to 47,000 titles. Since Ohio University uses approximately 24,000 records a year for cataloging, its total Membership Fee for 1973/74 will be $48,000. Since the average salary of the positions cancelled is over $5,000 it can be seen that Ohio University is effecting a slight savings while nearly doubling its catalog production..

Cost Analysis at the Cooperative College Library Center (CCLC)

The Cooperative College Library Center was established on August 1, 1969. Its express purposes as revealed in the feasibility study were many, namely to:

A. Increase the purchasing power of the dollar through quantity purchasing.

B. Decrease the overall cost of technical processing at each college. (It was estimated that the processing cost at the individual colleges ranged from $1.89 to ¢6.66 per title with an average cost of $4.39 per title. The study concluded that through the establishment of a technical processing center, the cost of technical processing could be reduced to $1.07 per title).

C. Minimize the need for additional staff (both clerical and professional) and in time replace the existing technical processing staffs at the individual colleges.

Manual Operation

The study gave a very detailed description for implementing a processing center. Initially the plan was adopted as set forth in the study. However, it became quite apparent after a very short period of time that the detailed plan was not workable as suggested with a staff of eleven full-time staff members. To date there are only nine full-time employees. In a manual operation it was mandatory that this staff of nine technically process approximately 50,000 volumes.

Table 1 is a chart of the work flow that was finally adopted for manual operation. It should be self-explanatory; however, there are several areas that need to be amplified. Initially, CCLC placed two copies of the multiple purchase

order forms in the union file with any available catalog copy. This step increased the existing filing time by approximately 30 hours per week. A minimum of seventy hours per week was spent filing proof slips, cataloging copy, and multiple order forms. Just prior to the cooperative arrangement with OCLC, CCLC had reduced the filing time to less than twenty hours per week. Initially there was very little duplication of orders in the ordering procedure. Since that time CCLC has increased duplicate ordering appreciably. As a result, CCLC has been able to decrease the amount of typing and thereby increase output. If CCLC received three or more copies of a title, the Center would produce one set of cards, and type the added entries on this set together with the charging materials. This set was revised, and all other complete sets were regenerated from it. This innovation saved on typing, revising, and the type of worker that could be used for final checking of material. The average turnaround time for a book with available catalog copy was from ten to fourteen days.

Cost

The feasibility study said that a technical processing center could process 60,000 titles and 90,000 volumes at a cost of $1.07 per volume. These figures are all grossly underestimated. It was concluded that the reason public

libraries had been successful in centralized processing was because of the purchasing of multiple copies of titles.

During fiscal year 1971, the Center processed 26,492 volumes. The Center's total budget for the year was $100,000. Therefore, the maximum cost was $3.77 per volume. This is 62¢ less per volume than the average cost as revealed in the feasibility study. With full commitment and cooperation, this figure could have been increased even more.

Table II is the organizational chart for the Center. There are five full time employees involved in cataloging. Utilizing 75 percent of the space and 95 percent of the supplies. Based on this, it cost $2.83 per volume for the cataloging aspect of our operation. With full participation and cooperation from member colleges this figure could have been reduced appreciably. However, a manual operation would require the employment of the two additional staff members and additional space if the figure of 90,000 volumes was to be reached.

Computerized Card Production

The Center entered into an agreement the the Ohio College Library Center for remote-access catalog card production on July 1, 1971. This venture was made possible through the grant of $50,000 from the Office of Education.

Table III is a chart of the work flow using the OCLC CRT

terminal. Five of the 19 required steps in the manual system have been eliminated. To date CCLC has been able to call records up for an average of 80 percent of the titles purchased by members. Then too, the Center has been able to find catalog copy for 19 percent of the remaining 20 percent in the National Union Catalog. This means that CCLC does less than one percent original cataloging. The feature of shared cataloging on the system should increase the 80 percent figure appreciably over a period of time.

On May 22, 1972, records for 352 volumes were called up and cataloged on the terminal. Since the amount of typing has been reduced, one typist can comfortably type charging materials for 300 volumes a day. It is quite apparent that CCLC received a malfunctioning CRT terminal; down time is unusually high. With this in mind, the director would estimate that the Center can comfortably catalog 200 titles during an eight-hour work day from the existing bibliographic information. This computes out to 2.4 minutes per title using cataloging data already in the data base. This means that 52,000 titles could be processed comfortably through the system in a year. This would decrease the turn-around time by one half to five days.

Cost for Center Operation

The OCLC system, if adopted, could decrease the in-house operating cost of the Center substantially. Table IV is a

comparative breakdown of the actual costs involved utilizing the two systems. The production could be increased by approximately 20,000 volumes annually with approximately seven full time employees. Then too, there would be substantial savings in fringe benefits, rent, supplies, and maintenance of equipment.

The director feels that the maximum that can be expected of a staff of nine is 50,000 volumes annually in a manual operation. Table IV reveals that this would cost approximately $2.42 per volume. This is still $1.97 cheaper than the individual colleges can do it. On the CRT terminal, a staff of seven can comfortably catalog approximately 70,000 volumes for approximately $1.35 per volume less the OCLC cost.

One must conclude that it is not economically feasible to technically process cooperatively for less than $2.00 per title. However, CCLC is firmly convinced that the $2.00 per title is considerably less than it would cost the individual colleges. One must further conclude that if there is a realistic, economical and viable way for cooperative technical processing to occur, it must involve computerization.

TABLE I

FLOOR CHART OF WORK FLOW
FOR MANUAL OPERATION

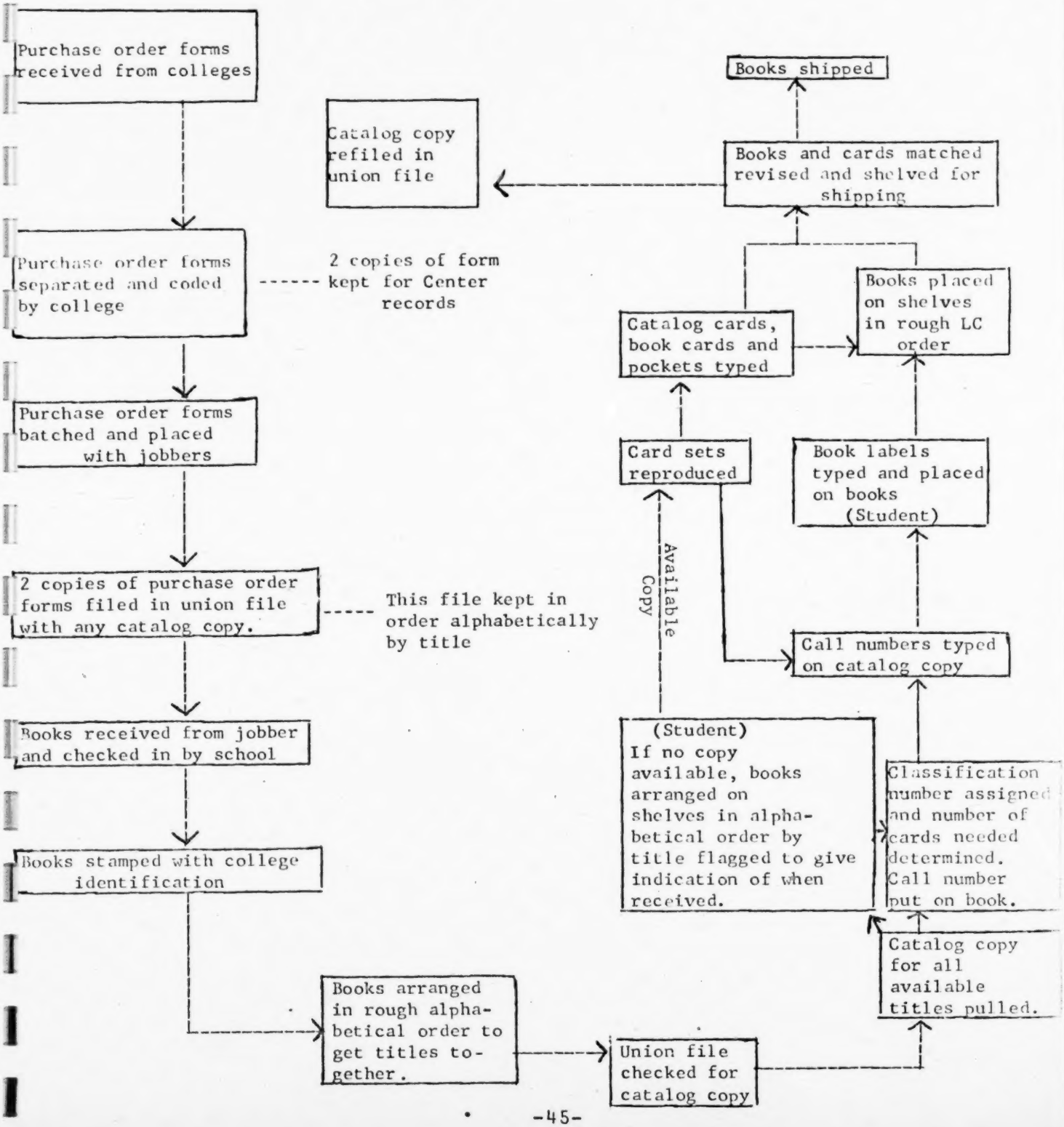
Purchase order forms received from colleges
Purchase order forms separated and coded by college
2 copies of form kept for Center records
Purchase order forms batched and placed with jobbers
2 copies of purchase order forms filed in union file with any catalog copy.
This file kept in order alphabetically by title
Books received from jobber and checked in by school
Books stamped with college identification
Books arranged in rough alphabetical order to get titles together.
Union file checked for catalog copy
Catalog copy for all available titles pulled.
Classification number assigned and number of cards needed determined. Call number put on book.
(Student) If no copy available, books arranged on shelves in alphabetical order by title flagged to give indication of when received.
Available Copy
Call numbers typed on catalog copy
Card sets reproduced
Book labels typed and placed on books (Student)
Catalog cards, book cards and pockets typed
Books placed on shelves in rough LC order
Books and cards matched revised and shelved for shipping
Catalog copy refiled in union file
Books shipped

TABLE II

Organizational Chart

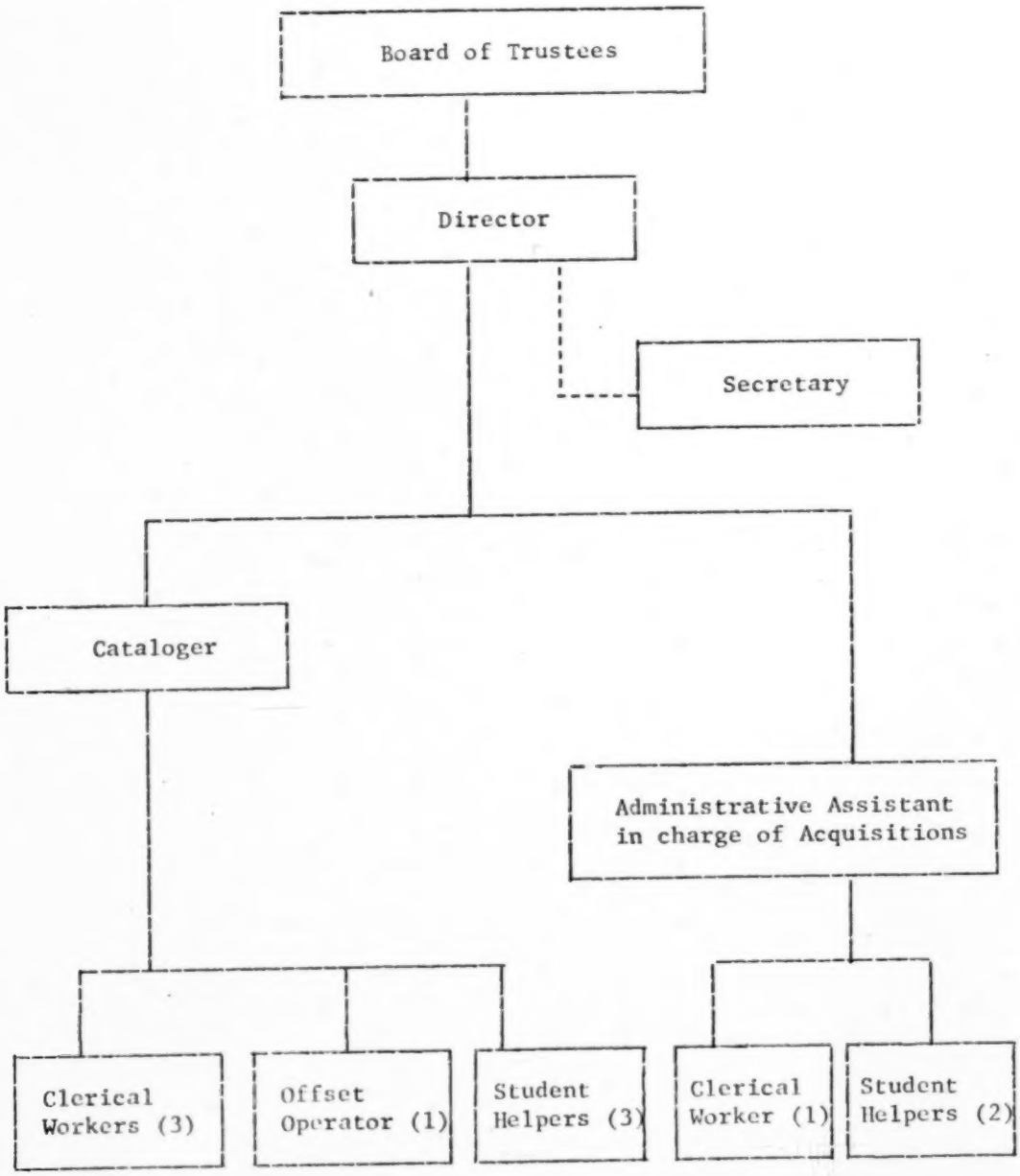

TABLE III

FLOOR CHART OF WORK FLOW
USING THE OCLC TERMINAL

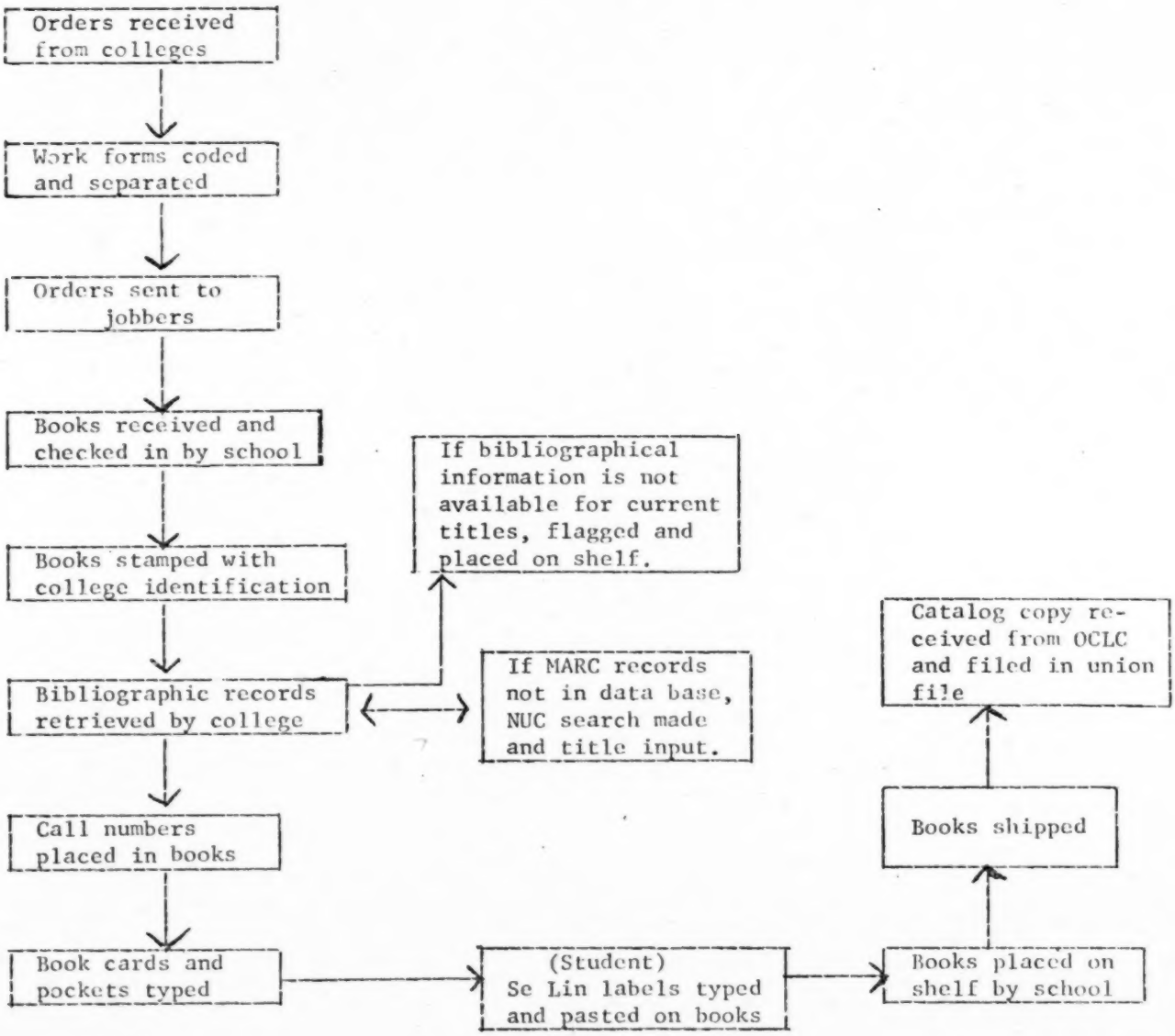
Orders received from colleges
Work forms coded and separated
Orders sent to jobbers
Books received and checked in by school
Books stamped with college identification
Bibliographic records retrieved by college
If bibliographical information is not available for current titles, flagged and placed on shelf.
If MARC records not in data base, NUC search made and title input.
Call numbers placed in books
Book cards and pockets typed
(Student) Se Lin labels typed and pasted on books
Books placed on shelf by school
Books shipped
Catalog copy received from OCLC and filed in union file

TABLE IV

Comparative Cost for CCLC Operations

MANUAL			COMPUTERIZED		
Category	Cost	Maximum Production	Category	Cost	Maximum Production
Salary of 9 Full Time Employees	$ 67,514	50,000 Volumes	Salary of 7 Full Time Employees	$52,739	70,000 Volumes
Fringe Benefits	11,400	N/A	Fringe Benefits	7,911	N/A
Rent	13,900	N/A	Rent	8,448	N/A
Equipment and Cataloging Tools	2,500	N/A	Equipment and Cataloging Tools	2,500	N/A
Supplies	10,000	N/A	Supplies	3,000	N/A
Telephone and Telegraph	3,000	N/A	Telephone and Telegraph	3,000	N/A
Postage	3,000	N/A	Postage	3,000	N/A
Delivery	3,000	N/A	Delivery	3,000	N/A
Insurance	800	N/A	Insurance	3,000	N/A
Maintenance of Equipment	2,000	N/A	Maintenance of Equipment	800	N/A
Contingent Fund	3,000	N/A	Contingent Fund	3,000	N/A
Entertainment	1,000	N/A	Entertainment	1,000	N/A
Legal Fees	1,200	N/A	Legal Fees	1,200	N/A
Annual Audit	1,500	N/A	Annual Audit	1,500	N/A
TOTALS	$120.814	50,000		$94,098	70,000

Cost per volume $2.42

Cost per volume excluding OCLC cost $1.35

PUBLICATIONS

The Center's staff prepared and published the following reports, articles, and documents. Copies of these publications constitute the appendises and the roman numeral preceeding each publication is its appendix number.

I. Instruction Manual for Catalog Production (February 1970)

II. Manual for OCLC Catalog Card Production (February 1971)

III. Creation of Machine Readable Catalog Entries; An Adaptation of the "Data Preparation Manual: MARC Editors" (May 1971)

IV. Cataloging on a Cathode Ray Tube Terminal (June 1971)

LI 004 423

V. A Brief Description of the Serials Controls System: A Preliminary Report (September 1971)

VI. A Preliminary Description of the OCLC Serials Control System (October 1971)

VII. Manual for Checking-In, Binding, and Claiming of Serials on a CRT Terminal - Draft of Preliminary Procedures (December 1971)

VIII. Suggested Minimum Requirements for Cataloging Serials (January 1972)

IX. OCLC Technical Processing System - A Preliminary Outline (February 1972)

X. The Technical Processing System - The Ohio College Library Center (May 1972)

XI. Recommended Standards for the Cataloging of Serials (May 1972)

XII. Standards for Input Cataloging (2 June 1972)

XIII. The Technical Processing System - The Ohio College Library Center (August 1972)

XIV. Ohio College Library Center. Annual Report (1971/1972)

XV. Long, Philip L.; Rastogi, K.B.L.; Rush, J.E.; and Wyckoff, J.A.: "Large On-Line Files of Bibliographic Data: An Efficient Design and a Mathematical Prediction of Retrieval Behavior", IFIP Congress 71; Ljubljana - August 1971. Amsterdam, North Holland Publishing Co., 1971. Booklet TA-3, pp. 145-149 (Not Available EDRS)

LI 004 424

XVI. Long, Philip L.; "OCLC Systems: Technical Aspects", Proceedings of the EDUCOM 1971 Fall Council Meeting and Conference pp. 98-100 (Not Available EDRS)

XVII. Long, Philip L.; Kilgour, Frederick G.: "Name-Title Retrieval from a MARC File", Journal of Library Automation 4 (December 1971) pp. 211-212 (Not Available EDRS)

XVIII. Long, Philip L.; Kilgour, Frederick G.: "A Truncated Search Key Title Index", Journal of Library Automation 5 (March 1972) pp. 17-20 (Not Available EDRS)

XIX. Kilgour, Frederick G.; Long, Philip L.; Leiderman, Eugene B.; Landgraf, Alan L.: "Title-Only Entries Retrieved by Use of Truncated Search Keys", Journal of Library Automation 4 (December 1971) pp. 207-210 (Not Available EDRS)

XX. Kilgour, Frederick G.: "Ohio College Library Center System", Proceedings of the EDUCOM 1971 Fall Council Meeting and Conference, pp. 92-97 (Not Available EDRS)

XXI. Kilgour, Frederick G.: "Evolving, Computerizing, Personalizing", American Libraries 3 (February 1972) pp. 141-147 (Not Available EDRS)

XXII. Kilgour, Frederick G.; Long, Philip L.; Landgraf, Alan L.; and Wyckoff, John A.: "The Shared Cataloging System of the Ohio College Library Center", Journal of Library Automation 5 (September 1972) In Press (Not Available EDRS

XXIII. Stewart, Robert C.; "Cataloging with a Computer - OCLC Comes to Pennsylvania", PLA Bulletin 28 (January 1973) pp. 9-15 (Not Available EDRS)

XXIV. Program/Subroutine Documentation - Master Data Base Update (MDBUPD) - LI 004 425

XXV. Program/Subroutine Documentation - Convert Call Number (CNVT) - LI 004 426

XXVI. Program/Subroutine Documentation - Generate Pack Definition Tables (GENPDTS)

XXVII. Program/Subroutine Documentation - Catalog Card Format Program (CCFP)

LI 004 427

XXVIII. Program/Subroutine Documentation - Build Print Tape (BPT) - LI 004 428

CONCLUSION

At the end of sixteen months of operation of the on-line system, it was apparent that with over 800,000 location listings in the on-line union catalog the resources of academic libraries within Ohio are rapidly becoming available to faculty and students at individual institutions. It was also clear from the experience of several libraries and of the Cooperative College Library Center that the system is cost beneficial.

The equipment employed, with the exception of the terminals, has proved to be more than adequately reliable for the operation of an on-line computerized regional library system. However, reliability of the terminals was improving at the end of 1972.

Programs proved to be as stable as the equipment once they had been de-bugged following introduction to operational status. Response time at the terminals was low with an estimated response time of four seconds or less for ninety percent of the requests put to the system.

The successful operation of the OCLC system has attracted attention from many foreign lands. OCLC has agreements with five other regions and at least a dozen more are seriously contemplating obtaining service from Columbus or replication of the system. The COMRESS study done for NELINET definitely

established the transferability of the system.

Although the OCLC on-line computerized regional library system has successfully achieved its initial goals, it must be emphasised that it is only at the beginning of the development of a whole new system of librarianship. There remains much more research, development and implementation to be carried out in the years that lie ahead.